Project Learning Practice of Quantity Surveying Firms

Hamzah Abdul-Rahman[1], Ali Mohammed Alashwal[2], and Zatil Hidayah Jamaludin[3]

[1,2]*Construction Innovation & Project Management Group, Faculty of Built Environment, University of Malaya (UM), 50603 Kuala Lumpur, MALAYSIA, arhamzah@um.edu.my, alialashwal@perdana.um.edu.my*

[3]*Faculty of Built Environment, University of Malaya (UM), 50603 Kuala Lumpur, MALAYSIA*

ABSTRACT

Quantity surveying firms in Malaysia are aware on the importance of learning from construction projects. However, it is not known how these firms can practice and implement this notion successfully. This paper aims at identifying the methods of learning as being practiced by these firms, the success factors and the barriers of project learning implementation. To achieve these aims a questionnaire survey followed by an interview were conducted. The interview used to validate and expand the results of the survey. The results indicated that on-the-job training is the preferable method to learn from project. Top management support was found to be one of the key factors of project learning success. In addition, top management support and employee participants are the main enablers / barriers of project learning implementation.

Keywords
Construction; Knowledge, Project learning practice, QS firms

1.0 INTRODUCTION

The success of the construction industry depends on good project management and the construction players' awareness and commitment towards the problems that arise during the course of the project. Project learning plays a vital role in adding-value to construction project (Abdul-Rahman, et al., 2008; Love & Edwards, 2004) and guarantee competitive advantages of the firms (Landaeta, 2008). However, learning is not an easy task. For instance, knowledge and experience of previous construction projects are usually in a tacit form (Schindler and Eppler, 2003). Consequently, knowledge of construction organizations would probably be lost after experts leave the organisation/company, although their knowledge is still required for future projects. Organizations rarely learn from their past projects because they do not have a mechanism to capture and store vital information and knowledge in place (Williams, 2008). Maqsood and colleagues (2006) stated that construction firms and personnel prefer to carry out their project management tasks based upon their past experience rather than following a textbook approach or established analytical approaches. Most of the Quantity Surveying firms face the same problems (Davis et al., 2007).

Project learning is believed to be a significant aspect to deal with the previous problems. This paper presents findings of investigation on the development of project learning approach in quantity surveying firms to assist consultants maintain good performance in the project environment. This paper identifies the preferred learning methods in construction projects and determines the success factors of implementing project learning. Findings on the barriers of implementing project learning and how to overcome these barriers are also presented. The reason for choosing quantity surveying firms is based on the authors' observation that there is a lack of investigation on these kinds of firms, specifically in Malaysia, though their role in developing the construction industry is considered vital.

2.0 PROJECT LEARNING AND LEARNING METHODS

Project learning practice can be defined as a set of actions that the project teams use to create and share knowledge within project (intra-project) and across projects (inter-project) (Kotnour 2000: p.396; Kotnour & Proctor, 1996). Intra-project learning can be defined as the acquisition and use of knowledge and experience within the same project (Gieskes & Broeke, 2000). It focuses on tasks within a single project and supports the delivery of a successful project by identifying the problems and solving them during the project life cycle (Kotnour & Vergopia, 2005). On the other hand, inter-project learning refers to the transfer of knowledge and experience from one project to other projects within the same time frame or to different projects over a period of time. It involves the combining and sharing of lessons learned across projects to develop a new knowledge (Kotnour & Kurstedt, 2000).

Schindler and Eppler (2003) have classified project learning review methods into two groups: process-based methods and documentation-based methods. Process-based methods are the gathering of lessons learned from concluded projects and explaining the relevant steps and sequences of a project's time line. It consists of two methods: Post-Project Appraisal and After Action Review. Post Project Appraisal (PPA) represents a special type of project review that includes a strong learning element. For the After Action Review method (AAR), it can help team members learn immediately from errors and successes. Meanwhile, the documentation-based method is more about learning from the project experience and the storage of contents within the organization. This method consists of micro articles, learning histories and recall. Micro articles are introduced to secure the experience after completion of a project. It is the process to transfer the experience to explicit form via the authorizing of small articles. Learning history is a written story which consists of the main events of a project arranged in a chronological order (Schindler and Eppler, 2003). Finally, recall is the method that every staff can submit based on their lessons learned directly using an internet browser (Maqsood et al., 2006). The usage of this method is to facilitate and automate the capture and the retrieval of the lessons learned.

Literature on project learning uncovered other methods of learning generally. According to Law and Chuah (2004) there are some tools that would improve team communication and consequently facilitate learning, namely, dialogue; learning histories; leadership styles and management techniques; and the role of organizational goals and strategies. In construction, in Malaysia, there are some methods among projects for learning including formal face-to-face interaction, periodic meetings, documentation learning, and problem solving methods (Abdul-Rahman, et al., 2008).

3.0 PROJECT LEARNING AND THE SUCCESS FACTORS

Davis, Watson and Man (2007) purported that most critical success factors of implementing project learning in quantity surveyor firms are top management support, employee active participation, application of IT systems and creating knowledge space. Without one of these factors, project learning cannot be implemented successfully. Rahman (2004) affirms that the head of department is the key player for the successful implementation of the learning process. He or she should be the major player in promoting project learning in the organization. Furthermore, the head of department (middle-manager) would encourage the creating and the sharing of tacit knowledge through the process of internalization and socialization or a combination of both (Nonaka, 1999).

Generally, establishing new roles and tasks for projects can help to support learning activities (Schindler and Eppler, 2003). In this regard, the role of the debriefer is crucial to facilitate and manage the debriefing of knowledge and learning. The debriefer identifies the critical key learning areas and must be responsible for the validation of the context information. Lastly, to ensure the success implementation of the project learning method, the complexity and the type of the projects shall be considered (Knauseder, et al., 2007).

4.0 BARRIERS OF PROJECT LEARNING IMPLEMENTATION

Majority of previous studies express that the main barriers for a firm to implement project learning are unwillingness of the team members to share their knowledge, lack of time and understanding of knowledge management and the difficulty to locate, capture, generalize and store knowledge (Davis et al., 2007 & Law and Chuah, 2004). Others, for example Rahman (2004), asserts that barriers always occur in motivating employees, difficulty in identifying knowledge management related roles and responsibilities, level of technology, ability of existing IT systems, obsolete data, information overload and data overload.

There are some difficulties that may hinder project learning implementation. Construction firms, usually, conduct more than one project at the same time. For this, individuals face difficulties to learn due to a limitation of time (Law & Chuah, 2004). Although construction is a highly informative and knowledge intensive industry, but the long life cycle of projects and the moving from one project to another could make it difficult for firms and individuals to cumulate knowledge over time (Fong & Chu, 2006; Taube, 2007). This may lead to the knowledge-forgetting phenomenon (Lam et al., 2001). To overcome this problem, Kotnour and Vergopia (2005) suggested including learning during the whole life cycle of the project. Another challenge is related to the human resources, where it is expected that the construction industry will lose a large portion of its skilled and knowledge workforce (Teerajetgul & Charoenngam, 2006) and this will, in turn, lead to the loss of important sources of knowledge and experience.

5.0 RESEARCH METHODOLOGY

A questionnaire survey was employed to gather data to respond to the objectives of this research. The questionnaire survey was used to present collective views about project learning methods,

implementation and barriers. Then, an interview was conducted to confirm and expand the results of the questionnaire. The target respondents of this research are the Principal, Senior Quantity Surveyors and Quantity Surveyors in quantity surveying firms. All the selected respondents were ensured to have between 4 to 20 years of experience in construction and had managed more than five projects during those years. The questionnaire was distributed in quantity surveyor firms, in Kuala Lumpur and Selangor Malaysia, which had been selected based on their working experience and their orientation towards project learning. A total of 318 questionnaires were sent out. The valid returned questionnaires were 58 that represent a response rate of 18 percent.

5.1 Respondents and Background of Firms

Most of the respondents of the questionnaire were top managers, directors or senior quantity surveyors. This gave the results higher accuracy and reliability due to the fact that the respondents have good construction knowledge, a high awareness on project learning issues and a better understanding of the construction industry matters. The highest percentage of the respondents, about 45 percent, is of those who have more than 20 years of experiences. More than 25 percent of the respondents were having 10 to 20 years experience. Table 1 illustrates the respondents and companies' background.

Table 1: Questionnaire respondents and companies' background

	Category Breakdown	Frequency	Percentage (%)
Respondents' Designation	Director	28	48.27
	Senior Quantity Surveyor	19	32.76
	Quantity Surveyor	7	12.07
	Assistant Qu Surveyor	4	6.9
Respondents' Experience	Less than 5 years	7	12.1
	5 to 10 years	10	17.2
	10 to 20 years	15	25.9
	More than 20 years	26	44.8
Company Status	Private individuals	35	60.3
	Corporate Organizations	23	39.7
Company experienced	Less than 5 years	4	6.9
	5 to 10 years	7	12.1
	10 to 20 years	26	44.8
	More than 20 years	21	36.2

All the chosen samples have experienced the lessons learned previously (lessons learned used more commonly in these firms). This indicates that the lessons learned are a common practice of the QS firms, in Malaysia. Most of the firms (about 70 percent) have between 10 to more than 20 years of experience and all have experienced lessons learned producing. The rest of the selected firms have between 5 to 10 years of experience. Thus, we can consider the selection of the respondents and the QS firms is justified to conduct the questionnaire survey.

6.0 FINDINGS AND DISCUSSION

6.1 The Questionnaire Survey

In answering the first objective of this paper, the results show that on-the-job training is the most common method of project learning practice. Referring to Figure 1 in the appendix, there are 14 different project learning methods, which identified from literature. On-the-job training, the highest mean of 4.04, is the most preferable technique implemented by the QS firms. This method might be the easiest, applicable way compared to others. The team members may feel that this way is easier for learning compile and developing a knowledge sharing spirit. The second common way of learning, according to the survey, is problem-solving techniques. For this method, a brainstorming session applies for the team members to share their knowledge. By using this method, the experience of QS can be written in a short note or "a Micro-article" (Schindler and Eppler, 2003). The other team members can refer to this note as guidance for their upcoming projects.

Another common method of learning is the periodic meeting. There are many types of meetings such as meeting minutes, ad hoc meeting, weekly meeting, monthly meeting etc. Main issues occur during the construction stage can be highlighted and recorded during the periodic meetings. Other employees can use this information as a reference to deal with similar situation. On the other hand, debriefing is another preferred method of learning. In this method, the individuals will be questioned in detail regarding the work that has been executed in terms of: failure, success, mistakes and innovation. This method could be categorized under the documentation learning method (Schindler and Eppler, 2003). This method is important because every generated lesson-learned needs to be documented properly. Besides, this method would reduce the problems related to knowledge sharing and learning process during the construction stage. According to the results of the survey, trial and error is rarely used during the pre-construction stage. It is, probably, due to the high risk associated with this method.

The second objective of this paper is to identify the success factor of implementing the project learning approach. The results affirm the findings of Davis et al. (2007), Rahman (2004), and Schindler and Eppler (2003). The successful implementation of project learning practice factors requires the support from

the top management. Other factors of the success of project learning implementation include, employees' participation and commitment; application of IT systems; institutionalised lessons learned; and culture changes. Team members must be willing to learn and share their knowledge and experience. In facilitating the application of project learning practice, the respondents emphasized on the application of information communication technology tools. Whereas, the study of Newell et al. (2002) emphasized that ICT alone is not a key enabler of this process; but it will be useful for cross project learning. Figure 2 (in the appendix) shows the results of the success factors of implementing project learning.

From the survey, there are many barriers that hamper project learning practice. Top management can be considered as a critical factor that drawbacks the implementation of project learning. Top management has dual role where it can encourage or discourage individuals to develop a knowledge sharing culture in the organizations. Managers face the problem of promoting the project learning practices (Law & Chuah, 2004) and encourage the staff to transfer their tacit knowledge to explicit knowledge (refer to figure 3 in the appendix for the other factors).

This investigation uncovered the factors to overcome these barriers. Figure 4 (in appendix) shows these factors, which include: top management support, application of IT systems, employee participants, changes and organization. Top management should encourage and motivate the employees to share their knowledge. Besides, the top management can increase the awareness of staff about the benefits of project learning as well as their change in behaviour as a result of learning. In fact, top management support is an important factor in assessing way of overcoming the barriers. However, this factor alone is not enough as the employees' discipline is necessary in developing a learning process. Moreover, the discipline of each team member must consider the employees' willingness to accept the changes while managing the learning process. On the other hand, providing appropriate training programs, which focus on developing knowledge sharing, can be a good way to overcome the barriers.

6.2 The Interview

Generally, all the interviewees agreed with the results of the questionnaire survey. Though they concur that the problem-solving technique is an important method of project learning, but one of the interviewees has her own standpoint that the problem solving technique is not an appropriate method, specifically, for the pre-construction stage, as the problems could defer from one stage to another. The interviewee stated that:

"The problem-solving technique is not effective to implement during the pre-construction stage unless the problem solving techniques will apply with the informal interaction and debriefing."

From the QS perspectives, information searching can be described as a project learning method. On the other hand, informal interaction can ease the communication, especially at the site. This affirms the suggestions in the literature about including the social relationship for knowledge sharing and learning, besides the utilization of ICT tools (e.g. Newell, et al., 2002; Fong & Chu, 2006; Styhre et al., 2006). In contrast, one of the respondents stated that:

"It is good if the company has applied the usage of information technology because even though there is a lack of discussion [face-to-face interaction], *team members can still transfer their tacit knowledge to the explicit knowledge in the database. Indeed, all the staff can refer to their information from the database and learn something new."*

According to the interviewees, work culture is very important to develop the project learning practice. The team members must have an initiative to accept the new changes in the organization to enhance the value of the work performance. The results of the interview also highlighted some barriers of project learning implementation include the lack of discipline and resources to learn. The team members always behave in a more enclosed manner and they think that they protect their rights of keeping knowledge to themselves.

The previous respondents' feedback from the questionnaire survey showed that the most critical barriers of project learning practices are top management, employee participants, organization and lack of application of IT systems, lack of discipline and lack of resources on the project learning practices. In spite of the barriers, all the interviewees have not considered top management as a barrier. They see management as a positive aspect that aids individuals all the time, and not as a drawback. The most common way to overcome the barrier is the role of top management to support sharing knowledge. Besides, managers have the duty of introducing new roles as for instance the debriefer, who is in charge to make sure that the relative information and knowledge are gathered, stored and retrieved appropriately.

One of the respondents argued that lacking of information technology (IT) systems is not indicated as barriers for lessons learned sharing. It is because knowledge can still be kept in simple software as Microsoft Office programs. On the other hand, the respondents from a private sector have different perspectives where they expressed that the application of IT system is not the best way to

overcome the barriers. It is due to the time constraint and unwillingness of the team members to share their knowledge. It is recommended here that construction companies have to develop a standard procedure of knowledge sharing and project learning during the pre-construction stage.

7.0 CONCLUSION

The top five project learning methods are: on-the-job training, problem solving techniques, having periodic meetings, debriefing and documentation learning. As a way to facilitate learning, some of the respondents affirmed the importance of having a portal to store the knowledge and experience of the QS experts.

Based on the survey, the main factor for successful learning is top management's support. Top management has the ability to influence and assist the staff to implement learning successfully. However, the role of employees and their commitment towards learning cannot be denied. Without employees discipline and participation, top management support will not benefit learning.

The findings from the study indicated that project learning confronts many barriers. The respondents' feedback showed that the most critical barriers are: top management, employee participation, lack of application of IT systems, lack of discipline and lack of resources on the project learning. The results of the interview showed other barriers as time constraint, staff unwilling to change and share their knowledge. However, managers can play important role in motivating the team members to overcome the difficulties of implementation of project learning.

This research shall be extended to include other professionals and stakeholders in construction as the client because this study was limited to QS professionals only. On the other hand, identifying the advantages of project learning implementation is recommended for future research. Furthermore, managing the lessons learned from previous project and apply them in new projects still one of the challenges that faces the QS firms.

Last but not least, achieving a high-performance construction projects and competitive firms requires the successful implementation of project learning, whereby each individual in the firm has the awareness and commitment for accomplishment and learning.

REFERENCES

Abdul-Rahman, H., Yahya, I. A., Berawi, M. A., & Low, W. W. (2008). Conceptual delay mitigation model using a project learning approach in practice. *Construction Mangement and Economics*, 26(1), 15-27.

Al-Reshaid, K., Kartam, N. Tewari,N. Al-Bader,H. (2008). A project control process in pre – construction phases. *Engineering, Construction and Architectural Management*, Vol. 12 No.4, pp.351-72.

Anheim, F. (2003). *Importance of the project team to the creation of learning within and between construction project*. In B. Attcin, J. Borgbrant & P.-e. Josephson (Eds.), Construction Process Improvement (pp. 184-192). Oxford, UK: Blackwell Ltd.

Anuj, D. R. and Anup, D. R. (2002). A Quantitative and Qualitative Approach To Knowledge Management - Episodic Extraction, Enhancement and Creation of Tacit Knowledge. *Knowledge Management International Conference and Exhibition (2006: Kuala Lumpur)*. Retrieved from http://www.eg2km.org/.pdf

Davis, R., Watson, P., and Man, C.H (2007) Knowledge Management for the Quantity Surveying Profession. Strategic Integration of Surveying Services, *FIG Working Week*, Hong Kong SAR, China. pp. 1-16.

Drejer, I., & Vinding, A. L. (2004). Organization anchoring of knowledge and innovation activity in the construction industry. *(DRUID Summer Conference 2004 on Industrial Dynamics, innovation and development, Elsinore, Denmark).*

Fong, P. S., & Chu, L. (2006). Exploratory Study of Knowledge Sharing in Construction Companies: A sociotechnical perspective. *Journal of Construction Engineering and Management ASCE*, September, 928-939.

Fu, W.-K., Lo, H.-P. & Drew, D. S. (2006) Collective learning, collective knowledge and learning networks in construction. *Construction Management and Economics*, 24, 1019 — 1028.

Gieskes, J. F. B., & Broeke, A. M. t. (2000). Infrastructure under construction: continuous improvement and learning in projects. *Integrated Manufacturing Systems*, 11(3), 188-198.

Knauseder, I., Josephson, P., and Styhre, A. (2007). Learning approaches for housing, service and infrastructure project organizations. *Construction Management and Economics*,857–867.

Kothari, C. R. (2005*). Research methodology: Methods & techniques* (2nd ed): New Age International Publishers. New Delhi.

Kotnour, T. (2000). Organizational Learning Practices in the Project Management Environment. *International Journal of Quality & Reliability Management*, 17(4/5), 393-406.

Kotnour, T., & Proctor, M. (1996). Processes and tools to support knowledge management in a virtual organization. *Paper presented at the International Conference on Engineering and Technology Management, IEMC 96,* Vancouver, BC, Canada.

Kotnour, T., & Kurstedt, H. A. (2000). Understanding the Lessons-Learned Process. *International Journal Of Cognitive Ergonomics*, 4(4), 311–330.

Kotnour, T., & Vergopia, C. (2005). Learning-Based Project Reviews: Observation and Lessons Learned from the Kennedy Space Center. *Engineering Management Journal 17*(4), 30-38.

Landaeta, R. (2008) Evaluating Benefits and Challenges of Knowledge Transfer Across Projects. *Engineering Management Journal* (on line). Retrieved 12 October 2008, from http://www.allbusiness.com/technology/software-services-applications/10594525-1.html

Lam, K. C., Lee, D., & Hu, T. (2001). Understanding the effect of learning-forgetting phenomenon to duration of projects construction. *International Journal of Project Management*, 19(2001), 411-420.

Law, K. M. Y., & Chuah, K. B. (2004). Project-based action learning as learning approach in learning organisation: the theory and framework. *Emerald Group Publishing Limited*, 10(7/8.2004), 178-186.

Love, P. and Edwards, D. (2004). Determinants of rework in building construction projects. *Engineering, Construction and Architectural Management*, Vol. 11 No. 4, pp. 259-274.

Maqsood, T., Finegan, A. and Walker, D. (2006) Applying Project Histories And Project learning Through Knowledge Management In An Australian Construction Company. *The Learning Organization*, Vol. 13 No. 1, 2006, pp. 80-95.

Newell, S., Scarbrough, H., Swan, J., Robertson, M., & Galliers, R. D. (2002). The importance of process knowledge for cross project learning: Evidence from a UK Hospital. *Paper presented at the Proceedings of the 35th Hawaii International Conference on System Sciences.*

Nonaka, I. (1999). The Dynamics of Knowledge Creation. In R. Ruggles & D. Holtshouse (Eds.), *The Knowledge Advantage: 14 visionaries define marketplace success in new economy* (pp. 64-87). Oxford, UK: Ernst & Young LLP.

Nonaka, I. and Takeuchi.H.(1995). *The Knowledge-Creating Company*. New York: Oxford University Press.

Rahman, A. B. (2004) Knowledge Management Strategy in Malaysia. *Paper presented at the Knowledge Management International Conference, Penang, Malaysia.*

Schindler, M., & Eppler, M. J. (2003). Harvesting Project Knowledge: A review of project learning methods and success factors. *International Journal of Project Management*, 21, 219-228.

Styhre, A., Josephson, P.-E. & Knauseder, I. (2006) Organization Learning in Non-writing Communities. *Management Learning*, 37, 83-100.

Täube, F. A. (2007) Sourcing and Transfer Of Knowledge In International Projects. Irnop Viii Project Research Conference Projects In Innovation, Innovation In Projects. Brighton, Uk.

Teerajetgul, W., Charoenngam, C. (2006), "Factors inducing knowledge creation: empirical evidence from Thai construction projects", *Engineering, Construction and Architectural Management*, Vol. 13 No.6, pp.584-99.

Thompson, F. (1968). *Chartered surveyors: The growth of a profession.* United Kingdom: Routledge and Kegan Paul Publishers.

Williams, T. (2008). How Do Organizations Learn Lesson From Projects – And Do They? *IEEE Transactions on Engineering Management*, 55(2), pp. 248-266.

Zainuddin, T. D. (2000). *The 2000 Budget Speech*. Dewan Rakyat, Kuala Lumpur.

Learning Method	N	Min.	Max.	Mean	Std. Deviation	Rank
Imitation	47	2	5	3.55	0.829	9
Informal interaction	56	3	5	3.73	0.674	6
Creation of new roles	41	2	5	3.29	0.716	
Periodic meeting	53	2	5	3.98	0.772	3
Debriefing	50	2	5	3.94	0.767	4
Problem solving techniques	48	2	5	4.00	0.772	2
Learn by helping people	53	2	5	3.70	0.774	7
Simulation	29	2	5	3.48	0.785	
On the job training	52	2	5	4.04	0.740	1
Job variation	51	1	5	3.57	0.806	8
Trial and error	41	1	5	3.22	0.936	11
Extrapolate past events	51	1	5	3.55	0.783	9
Internet Information searching	56	1	5	3.36	0.883	10
Documentation Learning	58	2	5	3.81	0.736	5
Valid N (listwise)	14					

Figure 1: Project learning methods of quantity surveying firms

Success Factors	N	Min.	Max.	Mean	Std. Deviation	Rank
Head of department should promote the benefits of lesson learnt	58	2	5	4.31	0.754	4
Head of department should encourage the sharing of knowledge and experiences among the staffs	58	3	5	4.47	0.706	1
Head of department encourage the transfer of explicit knowledge to explicit knowledge	58	3	5	4.26	0.664	5
Develop a database for storing a project info, project cost, duration of the projects and others	58	2	5	4.38	0.768	3
Using the mail, telephone, facsimile, intranet, video conferencing and telephone conferencing for communications, exchanging the ideas	58	2	5	3.90	0.831	10
Application of project management software for learning and sharing the knowledge	58	1	5	3.34	0.828	12
Disciplines	58	3	5	4.45	0.626	2
Have an incentives training to develop a knowledge sharing among the staffs	58	1	5	4.00	0.858	8
Try to motivate the team members to share the knowledge and experience from the previous projects	58	1	5	4.26	0.890	5
Knowledge and experience will be managed efficiently	58	2	5	4.14	0.736	7
Need to have changes in the culture of the organization	58	2	5	3.84	0.768	11
Changes in the development of management, learning, motivation and others	58	3	5	3.91	0.657	9

Figure 2: The success factors of project learning implementation.

Barriers of Project learning	N	Min.	Max.	Mean	Std. Deviation	Rank
Managers do not promote the project learning systems in the organizations	58	1	5	2.79	1.348	10
Managers do not encourage the staff to transfer the tacit knowledge in the staff minds to the explicit knowledge	58	1	5	2.79	1.321	10
Managers face the problem to motivate the staffs to share the knowledge	58	1	5	3.21	1.181	3
Unwillingness to share knowledge among the staffs	58	1	5	3.16	1.089	5
Unwillingness involve in the incentive training, workshop and others to develop a knowledge sharing	58	1	5	3.03	1.042	6
Lack of discussion, meeting, exchange the ideas within the staffs	58	1	5	3.24	1.144	2
Lack of incentives training to the employees to develop a knowledge sharing	58	1	5	3.00	1.009	7
Time consuming	58	1	5	3.17	1.172	4
Lack of discipline and lack of resources on the project learning practices	58	1	5	3.28	.988	1
Lack of database to store the knowledge from the previous projects	58	1	5	2.98	1.116	8
Lack of software to gather the knowledge and experience from the previous project such as Wessex Programme, Master Bill Programme and Build Soft	58	1	5	2.91	1.128	9
Valid N (listwise)	58					

Figure 3: Barriers of Implementing Project Learning

Overcoming the barriers	N	Min.	Max	Mean	Std. Deviation	Rank
Top management should encourage the knowledge sharing among staffs	58	2	5	4.33	.758	1
Top management should provide explanation to staffs about the benefits they will get when project is implemented	58	2	5	4.22	.773	2
Develop more software to gather the knowledge and experiences from the past projects	58	1	5	3.69	.922	11
Provide more telecommunication tools such as telephone, facsimile, intranet, video conferencing and telephone conferencing for communications, exchanging of ideas	58	1	5	3.74	1.001	10
Employees willingness to learn a software to store their knowledge	58	1	5	3.97	.917	8
Discipline	58	2	5	4.16	.894	4
Employees accept changes in managing their knowledge	58	2	5	4.16	.875	4
Need to have changes in the culture of the organization	58	2	5	3.95	.782	9
Employees must willing to adapt changes	58	2	5	4.14	.826	6
Need more discussion and exchange the ideas among the staffs	58	2	5	4.21	.720	3
Implement an appropriate training programme developing a knowledge sharing	58	2	5	4.09	.823	7
Valid N (listwise)	58					

Figure 4: Factors of overcoming the barriers while implementing project learning practices.